CLAIMS

1. A three-dimensional image display comprising:

two-dimensional image forming means formed by arranging a plurality of pixels, capable of forming a two-dimensional image by driving each of the pixels; and

three-dimensional image forming means for forming a three-dimensional image in a space based on the two-dimensional image formed by the two-dimensional image forming means.

2. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes:

a plurality of two-dimensional image forming elements each of which is formed by arranging a plurality of pixels and is capable of forming a two-dimensional image, and wherein the three-dimensional image forming means includes:

a light diffusing element provided in a face-to-face relationship with each of the plurality of two-dimensional image forming elements, the light diffusing element allowing light which has exited the respective two-dimensional image forming elements and has impinged thereupon to exit to the space in a diffused state; and

display control means for controlling the two-dimensional image forming elements such that the light which has exited the light diffusing element forms a multiplicity of point light source images that form a three-dimensional image in the space.

3. A three-dimensional image display according to claim 2,

wherein the display control means has a function of controlling the two-dimensional image forming elements by supplying data of two-dimensional images two-dimensionally representing a three-dimensional image to be displayed as a whole or in part from view points different from each other to the respective two-dimensional image forming elements, thereby forming the multiplicity of point light source images in the space with the light which has exited the light diffusing elements.

4. A three-dimensional image display according to claim 2, wherein the light diffusing element is formed with a converging portion capable of converging incident light at one point and a planer exit surface located at the converging point defined by the converging portion.

5. A three-dimensional image display display according to claim 4, wherein an entrance surface of the converging portion of the light diffusing element includes an aspherical surface having a convex configuration on the entrance side thereof.

6. A three-dimensional image display according to claim 4, wherein the entrance surface of the converging portion of the light diffusing element includes a spherical surface whose center of curvature is located at the converging point.

7. A three-dimensional image display according to claim 4, wherein the converging portion of the light diffusing element includes a Fresnel lens.

8. A three-dimensional image display according to claim 4, wherein the converging portion of the light diffusing element

converges light with an interference fringe formed on the entrance surface thereof.

9. A three-dimensional image display according to claim 2, wherein the light diffusing element is formed as a plate-like body or film with an interference fringe in a predetermined pattern formed thereon and is capable of converging incident light at one point or diverging incident light as if it were diffused from one point.

10. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes:

a plurality of two-dimensional image forming elements each of which is formed by arranging a plurality of pixels and is capable of forming a two-dimensional image, and wherein the three-dimensional image forming means includes:

a microscopic opening provided in a face-to-face relationship with each of the plurality of two-dimensional image forming elements, the microscopic opening allowing light which has exited the respective two-dimensional image forming elements and has impinged thereupon to pass through as it is; and

display control means for controlling the two-dimensional image forming elements such that the light which has exited the microscopic opening forms a multiplicity of point light source images that form a three-dimensional image in the space.

11. A three-dimensional image display according to claim 10, wherein the display control means has a function of controlling the two-dimensional image forming elements by supplying data of

two-dimensional images two-dimensionally representing a three-dimensional image to be displayed as a whole or in part from view points different from each other to the respective two-dimensional image forming elements, thereby forming the multiplicity of point light source images in the space with the light which has exited the microscopic opening.

12. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes:

a two-dimensional image forming panel formed by arranging a plurality of pixels, capable of forming a two-dimensional image by driving each of the pixels, and wherein the three-dimensional image forming means includes:

an optically opening/closing cell array formed by arranging a plurality of optically opening/closing cells, the optically opening/closing cell array being provided in a face-to-face relationship with the two dimensional image forming panel and allowing light which has exited the pixels of the two-dimensional image forming panel and has impinged thereupon to pass through as it is or blocking the same;

optically opening/closing cell control means for scanning the optically opening/closing cell array to control the optically opening/closing cells such that they sequentially enter an open state; and

display control means for controlling the two-dimensional image forming panel such that an image forming range of the two-dimensional image forming panel is sequentially shifted in

synchronism with the scan of the optically opening/closing cell array by the optically opening/closing cell control means and such that light which has exited pixels in the image forming range and has passed through the optically opening/closing cells in the open state of the optically opening/closing cell array forms a multiplicity of point light source images that form a three-dimensional image in the space.

13. A three-dimensional image display according to claim 12, wherein the display control means has a function of controlling the two-dimensional image forming panel by supplying data of two-dimensional images two-dimensionally representing a three-dimensional image to be displayed as a whole or in part from view points different from each other to the respective pixels in the image forming range of the two-dimensional image forming panel, thereby forming the multiplicity of point light source images in the space with the light which has passed through the optically opening/closing cells in the open state.

14. A three-dimensional image display according to claim 12, wherein a plurality of basic units including a pair of the two-dimensional image forming panel and the optically opening/closing cell array are arranged and wherein the optically opening/closing cell control means is provided for the optically opening/closing cell array of each of the basic units, the optically opening/closing cell control means controlling scan of the optically opening/closing cell array such that the optically opening/closing cells of the optically opening/closing cell

arrays in positions associated with each other enter the open state in synchronism with each other, the display control means controlling the two-dimensional image forming panel such that the image forming ranges of the two-dimensional image forming panels of the plurality of basic units are shifted in synchronism with the scan of the optically opening/closing cell array by the optically opening/closing cell control means and such that light which has exited pixels in the image forming ranges and has passed through the optically opening/closing cells in the open state of the optically opening cell arrays associated with each other forms a multiplicity of point light source images that form a three-dimensional image in the space.

15. A three-dimensional image display according to Claim 14, wherein the display control means has a function of controlling the two-dimensional image forming panel by supplying data of two-dimensional images two-dimensionally representing a three-dimensional image to be displayed as a whole or in part from view points different from each other to the respective pixels in the image forming ranges of the two-dimensional image forming panels of the plurality of basic units, thereby forming the multiplicity of point light source images in the space with the light which has passed through the optically opening/closing cells in the open state.

16. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes image formation control means for controlling an image forming

operation such that a two-dimensional image formed thereby changes with time, and wherein the three-dimensional image forming means includes deflecting means for deflecting the projecting direction of the two-dimensional image such that the projecting direction of the two-dimensional image formed by the two-dimensional image forming means changes in accordance with time-dependent changes of the two-dimensional image.

17. A three-dimensional image display according to claim 16, wherein the deflecting means includes a transmission direction variable type liquid crystal element in which liquid crystal molecules are aligned in the direction of an electric field to achieve a function of allowing light to be transmitted only in the direction of the electric field.

18. A three-dimensional image display according to claim 16, wherein the three-dimensional image forming means further has diffusing means for diffusing the projecting direction of a two-dimensional image in a direction which is different from the direction of deflection by the deflecting means.

19. A three-dimensional image display according to claim 16, wherein the image formation control means has a function of controlling the image forming operation such that the magnification of a two-dimensional image in the deflecting direction thereof in accordance with the projecting direction of the two-dimensional image deflected by the deflecting means.

20. A three-dimensional image display according to claim 16, wherein the two-dimensional image forming means further

includes:

receiving means for receiving encoded two-dimensional image data; and

decoding means for decoding the two-dimensional image data received by the receiving means.

21. A three-dimensional image display according to claim 20, wherein the deflecting means periodically performs the operation of deflecting the projecting direction of a two-dimensional image, and wherein the encoded two-dimensional image data received by the receiving means include:

first compressed encoded data provided in a position in timing in synchronism with the period of the deflecting operation of the deflecting means and obtained by compressing and encoding two-dimensional still image data independently; and

second compressed encoded data provided in a position adjacent to the first compressed encoded data and constituted by differential data representing the difference from the first compressed encoded data.

22. A three-dimensional image display according to claim 16, wherein the image formation control means can form a two-dimensional image in halftones by performing at least either pixel driving control on a time division basis or pixel driving control on a spatial basis.

23. A three-dimensional image display according to claim 16, wherein the deflecting means deflects the projecting direction of light which is being transmitted thereby.

24. A three-dimensional image display according to claim 16, wherein the deflecting means deflects the projecting direction of incident light when it reflects the same.

25. A three-dimensional image display according to claim 16, wherein the deflecting means is formed by arranging a plurality of rotatably disposed prisms or reflecting mirrors.

26. A three-dimensional image display according to claim 16, wherein the deflecting means is formed utilizing a hologram which can deflect incident light in a direction associated with the position of incidence.

27. A three-dimensional image display according to claim 26, wherein the deflecting means sequentially deflects incident light by shifting the hologram in directions different from the direction of incidence of the light.

28. A three-dimensional image display according to claim 26 or 27, wherein the deflecting means includes a plurality of sets of the holograms which are regularly arranged.

29. A three-dimensional image display according to claim 26, wherein the hologram is formed on a plate-like member.

30. A three-dimensional image display according to claim 29, wherein the deflecting means sequentially deflects incident light by reciprocating the plate-like member in a direction different from the direction of incidence of the light.

31. A three-dimensional image display according to claim 26, wherein the hologram is formed on a film-like member.

32. A three-dimensional image display according to claim

31, wherein the deflecting means sequentially deflects incident light by shifting the film-like member in one direction different from the direction of incidence of the light.

33. A three-dimensional image display according to claim 26, wherein the hologram is formed on a predetermined curved surface.

34. A three-dimensional image display according to claim 26, wherein the predetermined curved surface is a cylindrical surface.

35. A three-dimensional image display according to claim 16, wherein the deflecting means is formed using a light transmitting member whose thickness is locally changed in accordance with a signal voltage applied thereto to produce irregularities on the surface thereof.

36. A three-dimensional image display according to claim 16, wherein the deflecting means deflects the projecting direction of a two-dimensional image by deflecting light before it is subjected to image formation by the two-dimensional image forming means.

37. A three-dimensional image display according to claim 36, wherein the deflecting means includes a rotary reflecting body or refracting body.

38. A three-dimensional image display according to claim 36, wherein the deflecting means includes a light source which reciprocates and an optical system for guiding light emitted by the light source to the two-dimensional image forming means.

39. A three-dimensional image display according to claim 36, wherein the deflecting means includes a light source which can change the emitting direction of light in accordance with time-dependent change of a two-dimensional image formed by the two-dimensional image forming means.

40. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes a plurality of two-dimensional image forming elements each of which is formed by arranging a plurality of pixels and is capable of forming a two-dimensional image, and wherein the three-dimensional image forming means includes:

a plurality of point light sources which are respectively provided in a face-to-face relationship with the plurality of two-dimensional image forming elements and which emit light having directivity such that the respective two-dimensional image forming elements are illuminated by light diffusing from one point; and

display control means for controlling the two-dimensional image forming elements and the point light sources such that a three-dimensional image is formed by the light which has been emitted by the point light sources and has passed through the two-dimensional image forming elements.

41. A three-dimensional image display according to claim 40, wherein the display control means controls the two-dimensional image forming elements by supplying data of two-dimensional images two-dimensionally representing three-

dimensional image to be displayed as a whole or in part from view points different from each other to the respective two-dimensional image forming elements.

42. A three-dimensional image display according to claim 1, wherein the two-dimensional image forming means includes a two-dimensional image forming panel formed by arranging a plurality of pixels, capable of forming a two-dimensional image by driving each of the pixels, and wherein the three-dimensional image forming means includes:

a plurality of point light sources which are provided in a face-to-face relationship with the two-dimensional image forming panel and which emit light having directivity such that respective predetermined ranges of the two-dimensional image forming panel are illuminated by light diffusing from one point; and

display control means for controlling the two-dimensional image forming panel and the point light sources such that an image forming range of the two-dimensional image forming panel is sequentially shifted and such that the image forming range is illuminated by light emitted by the respective point light source to form a three-dimensional image with the light which has passed through the image forming range.

43. A three-dimensional image display according to claim 42, wherein the display control means controls the two-dimensional image forming panel by supplying data of two-dimensional images two-dimensionally representing a three-

dimensional image to be displayed as a whole or in part from view points different from each other to respective pixels in the image forming range of the two-dimensional image forming panel.

44. A three-dimensional image display comprising:

two-dimensional image forming means for forming a plurality of two-dimensional images with light which has been subjected to time-modulation based on information on a plurality of two-dimensional images; and

three-dimensional image forming means for forming a three-dimensional image by projecting the plurality of two-dimensional images formed by the two-dimensional image forming means in directions different from each other.

45. A three-dimensional image display according to claim 44, wherein the two-dimensional image forming means forms the two-dimensional images by scanning modulated light.

46. A three-dimensional image display according to claim 45, wherein the three-dimensional image forming means projects the plurality of two-dimensional images in directions different from each other by reflecting the light scanned by the two-dimensional image forming means in different directions in accordance with positions of incidence.

47. A three-dimensional image display according to claim 46, wherein the three-dimensional image forming means has a region which position information used for controlling the positions of incidence of the light scanned by the two-dimensional image forming means is recorded.

48. A three-dimensional image display according to claim 46, wherein the three-dimensional image forming means has a region in which synchronization information for synchronized control of the display as a whole is recorded.

49. A three-dimensional image display comprising:

two-dimensional image forming means for forming a plurality of two-dimensional images by emitting light carrying information on a plurality of two-dimensional images; and

three-dimensional image forming means for forming a three-dimensional image by projecting the light emitted by the two-dimensional image forming means in different directions in accordance with positions of incidence to project the plurality of two-dimensional images in directions different from each other, wherein the three-dimensional image forming means has a region in which position information used for controlling the positions of incidence of the light emitted by the two-dimensional image forming means is recorded.

50. A three-dimensional image display according to claim 49, wherein the three-dimensional image forming means further has a region in which synchronization information for synchronized control of the display as a whole is recorded.